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VOCATIONAL TALENT EXERCISES, PART C. ANSWERS.

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V O C A T I O N A L

T A L E N T

E X E R C I S E S

P A R T C

A N S W E R S

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ANSWERS

TABLE OF CONTENTS

VOCATIONAL TALENT EXERCISES

PART C

ANSWERS

Exercise 16 - Abstract Reasoning--Part 5

Drill 1			Drill 2			Drill 3		
1. B	4. A		7. C	10. E		13. C	16. C	
2. D	5. E		8. A	11. A		14. B	17. B	
3. D	6. C		9. D	12. C		15. E	18. E	

Exercise 17 - Technical Comprehension

Part 1 - The Steam Engine

Question	Answer	Explanation
1.	D	The steam goes from the steam pipe to the steam chest. You can trace the steam's path in the diagram. The arrows show the direction the steam takes.
2.	B	In the diagram you will see the steam entering the cylinder after it leaves the steam chest.
3.	A	The movement of the piston forces out the steam through the exhaust. In the diagram, you can see the steam going through the exhaust.
4.	C	The D valve is located inside the steam chest.

Part 2 - A Rotary Pump

1.	A	Liquid is carried around the outside of the pump from C to D.
2.	B	The teeth of the two gears carry the liquid around the outside.
3.	B	The pressure is greater in chamber D because the liquid is squeezed out here between the teeth.
4.	A	The liquid flows into chamber C because the teeth unmesh here and the teeth move away around the outside.
5.	C	The gears would carry the same amount of liquid because they are the same size and move at the same speed.

ANSWERS

Exercise 17 - Technical Comprehension

Part 3 - A Simple Series Circuit

Question	Answer	Explanation
1.	A	Since all bulbs and switches are connected in series, both switches must be closed to make any bulb burn.
2.	D	Taking out one bulb will break the circuit just as opening one of the switches will break it.
3.	C	All four bulbs will burn, because the wire between points D and C by-passes switch 1.
4.	B	Only two bulbs will burn. The circuit will run from the battery through bulbs 1 and 2 back to the battery.
5.	C	Three bulbs will burn. The connection from D to I by-passes switch 1 and bulb 3.
6.	D	Wiring points B and L together connects bulb 1 directly to the battery.

Part 4 - The Vacuum Power Cylinder

1.	A	In the top diagram, pressure is being applied, and the control valve is open.
2.	A	The piston pushes the air from the cylinder when the spring pulls the pull rod to the right. This is shown in the lower diagram on the right-hand side.
3.	B	The power cylinder is connected to the intake manifold of the engine. There is a partial vacuum in this manifold. In the top drawing you can see the air leaving the cylinder through the open valve and going to the intake manifold.
4.	B	There is atmospheric pressure on both sides of the piston because air comes in through the valve to fill the partial vacuum. This releases the brake. The spring retracts the piston.
5.	A	The white arrows show the motion of the air under atmospheric pressure.
6.	B	The valve closes the connection between the left side of the cylinder and the manifold. At the same time, it opens a path for atmospheric pressure to equalize the pressure on both sides of the piston. It is the spring that draws the piston back to its original position.

ANSWERS

Exercise 18 - Brick Counting

Part 1

Drill 1

1.	6	5.	5	9.	10		
2.	9	6.	10	10.	8		
3.	7	7.	8	11.	6		
4.	12	8.	7	12.	13		

Drill 2

1.	6	5.	15	9.	8		
2.	8	6.	13	10.	13		
3.	14	7.	7	11.	14		
4.	7	8.	8	12.	16		

Part 2

Drill 1

	A	B	C		A	B	C
1.	3	3	3	4.	2	3	2
2.	3	3	2	5.	5	5	5
3.	1	3	3	6.	4	6	4

Drill 2

	A	B	C		A	B	C
1.	4	3	6	4.	4	4	3
2.	4	3	4	5.	3	3	5
3.	4	4	5	6.	4	5	5

Exercise 19 - Technical Comprehension

Part 1 - The Four-Cycle Gasoline Engine

Question	Answer	Explanation
1.	A	The small arrows on the drawing show that the air and fuel enter the cylinder through the open intake valve.
2.	C	The diagram of the compression stroke shows that the intake valve and the exhaust valve are both closed. The mixture of fuel and air is squeezed (compressed) into a small space as the piston moves upward.
3.	D	In the diagram of the power stroke, the valves are closed. The pressure is pushing the piston down.
4.	B	In the diagram of the exhaust stroke, the small arrows show the burned mixture escaping through the exhaust valve.
5.	C	The four strokes are the intake stroke, the compression stroke, the power stroke, and the exhaust stroke.

ANSWERS

Exercise 19 - Technical Comprehension

Part 2 - The Hand Pump

Question	Answer	Explanation
1.	D	When the handle is going down, valve 1 closes, lifting the water above the piston.
2.	A	The down stroke is shown in the left-hand picture, with valve 1 open and valve 2 closed.
3.	B	The up stroke is shown in the right-hand picture, with valve 1 closed and valve 2 open.
4.	C	When the piston goes up, a partial vacuum is created below it allowing atmospheric pressure to raise the water in the pipe.

Part 3 - A Vacuum Tube

1.	B	The cutaway drawing shows the cathode between the filament and the plate (anode).
2.	A	It is the grid circuit that is amplified by the triode tube.
3.	B	The air is taken out of the radio tube to make the electrons flow more freely.
4.	D	Very weak signals are received at the antenna. This is the signal that is taken to the grid of the triode to be amplified.
5.	C	The primary purpose of the filament is to supply heat. This is necessary in order to make the cathode give off electrons.
6.	A	The grid is directly between the cathode and the plate. All the electrons going between the cathode and the plate must go through the grid.

Part 4 - The Coil-Type Gauge Circuit

1.	A	The limiting coil is on the side of the gauge marked "E".
2.	B	The operating coil is on the side marked "F". As the operating coil gets stronger, the magnet on the needle is drawn toward the "F".
3.	B	The rheostat is part of the sending unit, which is located at the gasoline tank.
4.	D	The float and arm change the position of the rheostat contact. This changes the current flowing through the operating coil, which changes the position of the needle.
5.	C	The drawing shows the rheostat within the sending unit.

ANSWERS

Exercise 20 - Abstract Reasoning--Part 6

Drill 1

1. 51	12. 81	23. 89
2. 32	13. 60	24. 85
3. 13	14. 65	25. 10
4. 80	15. 14	26. 90
5. 53	16. 49	27. 18
6. 52	17. 31	28. 18
7. 79	18. 54	29. 47
8. 55	19. 67	30. 85
9. 8	20. 56	31. 85
10. 39	21. 88	32. 18
11. 74	22. 42	

Drill 2

1. 9	12. 91	23. 46
2. 39	13. 69	24. 96
3. 3	14. 28	25. 99
4. 45	15. 9	26. 84
5. 29	16. 10	27. 13
6. 61	17. 72	28. 45
7. 92	18. 45	29. 37
8. 26	19. 14	30. 24
9. 21	20. 83	31. 89
10. 84	21. 69	32. 17
11. 38	22. 20	

Exercise 21 - Technical Comprehension

Part 1 - The Two-Cycle Engine

Question	Answer	Explanation
1.	D	In the first drawing, the arrows show the direction of motion of the fuel-air mixture. Notice that it enters through the inlet.
2.	A	When the piston moves down, the fuel-air mixture enters the cylinder through the intake port. This is shown in the right-hand drawing.
3.	D	In the right-hand drawing the burned mixture is shown leaving through the exhaust port.
4.	C	The exhaust port is closer to the top of the piston than the intake port. Therefore, it is uncovered first after the spark plug fires.

Part 2 - A Liquid Cooling System for Automobile Engines

1.	C	In the diagram you can see the engine water jacket. The water jacket covers the cylinders.
2.	B	The white arrows show the way the coolant travels. Notice that the coolant travels the same route again and again. This is called circulation.
3.	A	The coolant enters the radiator through the radiator hose inlet. Find this hose on your diagram.
4.	A	The coolant goes through the radiator outlet hose to the water pump. The pump forces the coolant into the cylinder block, from which it travels to the top of the radiator again.

ANSWERS

Exercise 21 - Technical Comprehension

Part 3 - A Simple Direct Current Motor

Question	Answer	Explanation
1.	C	The electric current is necessary to energize the electromagnet in the armature.
2.	C	The brushes and the commutator segments cause the current to change direction as the armature rotates.
3.	B	The commutator rotates with the armature. Each segment of the commutator is connected to one side of the armature coil.
4.	B	The arrow shows that the armature coil is rotating counterclockwise.

Part 4 - A Gear Train

1.	D	Gear F moves faster than any other gear when the gear train is in motion. Gear A moves the slowest.
2.	C	Gear D moves at the same speed because it is fixed to the same shaft as gear E. It also turns in the same direction.
3.	C	In the picture the arrows show both gear C and gear E turning in the same direction as gear A. All the other gears turn in the opposite direction.
4.	A	The speed ratio between gears A and C is the same as between gears A and B, which is 2 to 1.
5.	B	The speed ratio between gears B and E is the same as the ratio between gears C and D, which is 3 to 1.
6.	B	According to the picture, gear A is the driving gear and gear F is the driven gear. Since gear F makes 12 revolutions for every revolution of gear A, the purpose must be to increase speed.

Exercise 22 - 3-D Visualization--Part 3

Drill 1			Drill 2			Drill 3		
1. A	4. C		7. C	10. C		13. D	16. B	
2. E	5. B		8. D	11. A		14. B	17. E	
3. C	6. A		9. E	12. D		15. E	18. A	

ANSWERS

Exercise 23 - Technical Comprehension

Part 1 - The Four-Cycle Diesel Engine

Question	Answer	Explanation
1.	B	When the fuel-and-air mixture burns, the heat causes it to expand. The pressure of this expansion forces the piston down.
2.	C	When the fuel meets the hot compressed air, the mixture catches fire. The piston is then pushed down in the power stroke.
3.	D	The piston moves down. Notice the arrow pointing down in the drawing of the intake stroke.
4.	C	The piston moves up on the compression stroke. It must move up in order to squeeze the air into a smaller space.
5.	A	Both valves are closed and fuel is forced into the cylinder under pressure where it mixes with the hot air.
6.	C	On the intake stroke, only air enters. Fuel is injected into the cylinder at the end of the compression stroke.

Part 2 - A Gasoline Engine Fuel System

1.	D	The fuel is stored in the fuel tank. The tank is shown on the right side of the drawing.
2.	B	There is a fuel gauge unit on the instrument panel and another unit on the fuel tank.
3.	D	A wire runs from one gauge to the other, as shown by the line of dashes in the diagram.
4.	C	As the fuel leaves the fuel pump, it goes through the tube between the pump and the carburetor.
5.	D	The union is in the tube between the fuel tank and the fuel filter.
6.	A	The diagram shows a rear and a front part to the fuel tank to filter tube.

ANSWERS

Exercise 23 - Technical Comprehension

Part 3 - A Simple Door Bell

Question	Answer	Explanation
1.	D	The fixed side of the contact points is attached to the mounting of the bell.
2.	D	The electromagnet is stronger than the spring when it is magnetized. When it is not, the spring draws the armature back to its starting point.
3.	A	The contact points must be closed; otherwise, no current would flow through the electromagnet.
4.	D	The clapper has no current running through it. The current runs through the moving contact point attached to the armature.

Part 4 - A Simplified Carburetor

1.	B	Intake air which is suddenly forced into a smaller space will speed up to maintain the same volume of air flow. At the same time, the air pressure at this point will decrease.
2.	C	All the air which flows through the air horn goes to the intake manifold.
3.	A	The gasoline is atomized at the nozzle, which sticks into the venturi.
4.	D	The venturi is shaped like an hourglass.